

Distribution of Euglenida in North Florida

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THE great diversity of aquatic situations in the State of Florida lends itself ideally to limnological and ecological studies of the microfauna of various habitats. During the course of this study, a number of these habitats in north and central Florida were periodically sampled for determination of their protozoan fauna. This paper represents a compilation of the data for the order Euglenida.

DESCRIPTION OF HABITATS

Large Streams. One river, the Santa Fe, was sampled periodically during this study. From its source near Lake Santa Fe, Bradford-Alachua County, it flows westerly and slightly to the north, to a point near Branford, Suwannee County, where it empties into the Suwannee River. The Santa Fe is a "black" river, colored by the addition of various organic materials derived from pine flatwoods and cypress swamps. Four sampling stations were used. These were at O'Leno State Park in Columbia County, Worthington Springs in Union County, four miles south of Starke on U.S. Route 301 in Bradford County, and at the river's mouth in Suwannee County.

Small Streams. Hogtown Creek in Gainesville, Alachua County, was sampled during this study. This creek is a relatively shallow stream with moderate flow. Both sandy and silty bottom conditions occur. Samples were taken at a number of randomly picked points.

Sinks and Lakes. Sinks and lakes are conspicuous elements in the aquatic situations of north and central Florida. Mainly of solution origin, these vary in size from a few feet in diameter to relatively large bodies of water. Bottom conditions range from sand to silt, and the amount of rooted and floating vegetation varies considerably. Lake Alice, Lake Santa Fe, Lake Newnan, and Lake Hampton in Alachua County and Lake Kingsley in Bradford County were periodically sampled. In addition, samples were taken from several sinks found on the campus of the University of Florida.

Cypress Ponds. Cypress ponds are numerous in north and central Florida. Fluctuating water levels create a variable habitat frequently reflected by changes in the species composition of the microfauna inhabiting these ponds. A number of ponds near Otter

Creek in Levy County, and several smaller ponds in Alachua County were sampled. The latter were located within the Gainesville city limits, and near the large sink known locally as the Devil's Millhopper.

Miscellaneous. In addition to the habitats listed above, a number of temporary or artificial aquatic situations were sampled. These included numerous roadside ditches throughout north and central Florida, settling lagoons for sewage disposal plants in Ocala and Gainesville, and a small pond, hereafter referred to as Campus Pond, behind the sewage disposal plant for the University of Florida. Campus Pond is maintained by receiving final effluent from the disposal plant.

METHODS

With the exception of roadside ditches, habitats were sampled monthly. The temporary nature of such ditches prevented periodic sampling. Samples were taken from the bottom, surface, and at intermediate depths. Formaldehyde was added to these as a preservative. Temperature and pH data were recorded at the time of collecting. Samples were centrifuged and subsamples of the precipitate examined.

FAUNAL LIST

- Euglena acus* Ehrenberg. Santa Fe River, Hogtown Creek, sinks, Lake Alice, cypress ponds, roadside ditches, Campus Pond.
- Euglena sciotensis* Lackey. Campus Pond.
- Euglena oxyuris* Schmarda. Hogtown Creek, cypress ponds, roadside ditches, Campus Pond.
- Euglena spadix* Gojdics. Sinks.
- Euglena oblonga* Schmitz. Sinks.
- Euglena mutabilis* Schmitz. Santa Fe River.
- Euglena rostrifera* Johnson. Hogtown Creek, settling lagoons, Cypress Pond.
- Euglena gaumei* Allorge and Lefevre. Cypress ponds, Campus Pond.
- Euglena flava* Dangeard. Sinks, Lake Santa Fe, Campus Pond.
- Euglena agilis* Carter. Settling lagoons.
- Euglena fusca* (Klebs) Lemmermann. Lake Newnan, cypress ponds, Campus Pond.
- Euglena helicoideus* (Bernard) Lemmermann. Cypress ponds.
- Euglena vivida* Playfair. Roadside ditches.
- Euglena convoluta* Korshikov. Cypress Ponds.
- Euglena allorgei* Deflandre. Campus Pond.
- Euglena chadefaudii* Bourrelly. Sinks.
- Euglena limnophila* Lemmermann. Santa Fe River, Hogtown Creek, sinks, cypress ponds, roadside ditches.

- Euglena spirogyra* Ehrenberg. Hogtown Creek, cypress ponds, Campus Pond.
Euglena hemichromata Skuja. Sinks, settling lagoons.
Euglena mangini Lefevre. Santa Fe River, Campus Pond.
Euglena ehrenbergii Klebs. Lake Santa Fe, cypress ponds, roadside ditches, Campus Pond.
Euglena grisoli Deflandre. Hogtown Creek.
Euglena velata Klebs. Santa Fe River, settling lagoons, Campus Pond.
Euglena splendens Dangeard. Cypress ponds.
Euglena chlamydophora Mainx. Cypress ponds.
Euglena mainixi Deflandre. Campus Pond.
Euglena deses Ehrenberg. Hogtown Creek.
Euglena proxima Dangeard. Santa Fe River, Lake Santa Fe, Campus Pond.
Euglena subehrenbergii Skuja. Campus Pond.
Euglena elenkinii Poljanski. Campus Pond.
Euglena tuberculata Drezepolski. Santa Fe River, cypress ponds, Campus Pond.
Trachelomonas volvocina Ehrenberg. Hogtown Creek, sinks, Santa Fe River, Lake Santa Fe, Lake Newnan, Lake Hampton, cypress ponds, roadside ditches, Campus Pond.
Trachelomonas hispida (Perty) Stein. Santa Fe River, Hogtown Creek, sinks, Lake Alice, Lake Santa Fe, Lake Hampton, cypress ponds, roadside ditches, settling lagoons, Campus Pond.
Trachelomonas caudata (Kefferath) Conrad. Lake Alice.
Trachelomonas armata (Ehrenberg) Stein. Cypress ponds, roadside ditches.
Trachelomonas fusiformis Deflandre. Cypress ponds.
Trachelomonas urceolata Stokes. Sinks, Campus Pond.
Trachelomonas acanthostoma Stokes. Sinks, cypress ponds.
Trachelomonas rotunda Swirenko. Santa Fe River, cypress ponds, Campus Pond.
Trachelomonas gibberosa Playfair. Cypress ponds, Campus Pond.
Trachelomonas oblonga Lemmermann. Santa Fe River, cypress ponds.
Trachelomonas abrupta Swirenko. Santa Fe River, Lake Hampton.
Trachelomonas superba Swirenko. Lake Hampton.
Trachelomonas pulcherrima Playfair. Cypress ponds, Campus Pond.
Trachelomonas polonica Drezepolski. Cypress ponds.
Trachelomonas bacillifera Playfair. Sinks, cypress ponds, Campus Road.
Trachelomonas zorensis Deflandre. Lake Hampton, Campus Pond.
Trachelomonas acuminata (Schmarda) Stein. Santa Fe River, sinks, Campus Pond.
Trachelomonas rugulosa Stein. Lake Newnan.
Trachelomonas speciosa Deflandre. Cypress ponds.
Trachelomonas intermedia Dangeard. Cypress ponds.
Trachelomonas angustispina Deflandre. Cypress ponds, Santa Fe River.
Trachelomonas allia Drezepolski. Cypress ponds, roadside ditches.
Trachelomonas verrucosa Stokes. Campus Pond.
Trachelomonas perforata Awer. Cypress ponds, roadside ditches, Campus Pond.
Trachelomonas allorgei Deflandre. Campus Pond.

- Trachelomonas subglobosa* Skvortzov. Santa Fe River.
Trachelomonas tambowika Swirenko. Santa Fe River.
Trachelomonas dubia Swirenko. Cypress ponds.
Trachelomonas hexangulata Swirenko. Cypress ponds.
Trachelomonas lacustris Drezepolski. Cypress ponds.
Trachelomonas giardiana Playfair. Cypress ponds, Campus Pond.
Trachelomonas woycickii Koczwara. Lake Hampton.
Trachelomonas spectabilis Deflandre. Cypress ponds.
Trachelomonas globularis (Awer.) Lemmermann. Santa Fe River, cypress ponds.
Trachelomonas magdaleniana Deflandre. Cypress ponds.
Trachelomonas bernardinensis Vischer. Cypress ponds.
Trachelomonas sarmatica Drezepolski. Cypress ponds.
Trachelomonas niklewskii Drezepolski. Cypress ponds.
Trachelomonas lackeyi McCoy. Campus Pond.
Lepocinclis ovum (Ehrenberg) Lemmermann. Santa Fe River, Hogtown Creek, sinks, Lake Alice, cypress ponds, Campus Pond.
Lepocinclis marssonii Lemmermann. Santa Fe River, cypress ponds.
Lepocinclis texta (Dujardin) Lemmermann. Hogtown Creek, sinks, settling lagoons, Campus Pond.
Lepocinclis cymbiformis Playfair. Sinks, cypress ponds, Campus Pond.
Lepocinclis glabra Drezepolski. Cypress ponds, Campus Pond.
Lepocinclis globosa France. Campus Pond.
Phacus curvicauda Swirenko. Santa Fe River, sinks, Campus Pond.
Phacus alatus Klebs. Sinks, Campus Pond.
Phacus pusilus Lemmermann. Sinks.
Phacus horridus Pochmann. Cypress ponds.
Phacus glaber (Deflandre) Pochmann. Sinks, cypress ponds, Campus Pond.
Phacus inflexus Pochmann. Campus Pond.
Phacus pyrum (Ehrenberg) Stein. Sinks.
Phacus circumflexus Pochmann. Campus Pond.
Phacus hamatus Pochmann. Campus Pond.
Phacus corculum Lemmermann. Campus Pond.
Phacus caudatus Hubner. Lake Alice, cypress ponds.
Phacus onyx Pochmann. Cypress ponds, roadside ditches, settling lagoons, Campus Pond.
Phacus undulatus Pochmann. Sinks, cypress ponds.
Phacus margirittatus Pochmann. Santa Fe River, sinks.
Phacus granum Drezepolski. Campus Pond.
Phacus thrombus Pochmann. Sinks, Campus Pond.
Phacus segreti Allorge and Lefevre. Cypress ponds.
Phacus ranula Pochmann. Sinks.
Phacus suecicus Lemmermann. Santa Fe River, sinks, cypress ponds, Campus Pond.
Phacus tortus (Lemmermann) Skvortzov. Sinks, cypress ponds, Campus Pond.
Phacus trypanon Pochmann. Cypress ponds, Campus Pond.
Phacus musculus Pochmann. Sinks, cypress ponds.

- Phacus atrakoides* Pochmann. Cypress ponds, Campus Pond.
Phacus acuminatus Stokes. Sinks, cypress ponds, Campus Pond.
Phacus platalea Drezepolski. Cypress ponds, Campus Pond.
Phacus longicauda (Ehrenberg) Dujardin. Sinks, cypress ponds, roadside ditches, Campus Pond.
Phacus orbicularis Hubner. Sinks.
Phacus wettsteini Drezepolski. Campus Pond.
Phacus makrostigma Pochmann. Sinks, cypress ponds.
Phacus carinatus Pochmann. Sinks, Campus Pond.
Phacus circulatus Pochmann. Cypress ponds.
Phacus pleuronectes (O. F. Muller) Dujardin. Sinks, cypress ponds, Campus Pond.
Phacus raciborski Drezepolski. Cypress ponds.
Phacus aenigmaticus Drezepolski. Campus Pond.
Cryptoglena pigra Ehrenberg. Sinks, cypress ponds, Campus Pond.
Anisonema steini Stokes. Cypress ponds.
Anisonema grande Stein. Sinks
Entosiphon sulcatum (Dujardin) Stein. Sinks.
Entosiphon ovatum Stokes. Sinks.
Menoidium gracile Stokes. Sinks, cypress ponds, Campus Pond.
Menoidium tortuosum Stokes. Sinks.
Menoidium pelucidom Perty. Sinks.
Distigma proteus Ehrenberg. Sinks, cypress ponds.
Peranema tricophorum Ehrenberg. Campus Pond.
Euglenopsis vorax Klebs. Sinks.

DISCUSSION

Eleven genera representing 121 species were recorded during the course of this study. Cypress ponds, Campus Pond, and sinks were the habitats containing the greatest number of species. For each habitat, the percentage of the total number of species found is as follows: cypress ponds, 52 per cent; Campus Pond, 49 per cent; sinks, 35 per cent; Santa Fe River, 18 per cent; lakes (combined) 13 per cent; ditches, 9 per cent; Hogtown Creek, 8 per cent; settling lagoons, 6 per cent. A given species was frequently found in more than one habitat. For each genus, the largest number of species was found in either cypress ponds, Campus Pond, or sinks (Table 1).

Cypress ponds, sinks, and Campus Pond contained 109 of the 121 recorded species, 75 of which were only found here. A total of 44 species was recorded from more than one of these habitats with the following distribution: cypress ponds and sinks, 7 species; cypress ponds and Campus Pond, 15 species; sinks and Campus Pond, 8 species; cypress ponds, sinks, and Campus Pond, 14 species.

TABLE 1
Habitat of Species of Euglenida

Genus	Species Recorded	Santa Fe River	Hogtown Creek	Sinks	Lakes	Cypress Ponds	Roadside Ditches	Settling Lagoons	Campus Pond
<i>Euglena</i>	31	7	7	7	5	12	5	4	17
<i>Trachelomonas</i>	39	10	1	5	9	25	4	1	13
<i>Phacus</i>	34	3	0	18	1	18	2	1	21
<i>Lepocinclis</i>	6	2	2	3	1	4	0	1	5
<i>Cryptoglena</i>	1	0	0	1	0	1	0	0	1
<i>Anisonema</i>	2	0	0	1	0	1	0	0	0
<i>Entosiphon</i>	2	0	0	2	0	0	0	0	0
<i>Menoidium</i>	3	0	0	3	0	1	0	0	1
<i>Distigma</i>	1	0	0	1	0	1	0	0	0
<i>Peranema</i>	1	0	0	0	0	0	0	0	1
<i>Euglenopsis</i>	1	0	0	1	0	0	0	0	0
Totals	121	22	10	42	16	63	11	7	59

Environmental conditions in the habitats above were apparently more favorable to euglenoids than those of other sample areas. The number of shared species suggest important similarities between these habitats. With the limited data available, such conditions and similarities could not be determined. The pH of these habitats was variable. Sinks were alkaline with a range of 7.1 to 7.8 and a mean of 7.3. Campus Pond ranged from 6.7 to 8.4 with a mean of 7.5. Cypress ponds were acid with a range of 6.4 to 6.8 and a mean of 6.6. Temperature was not considered to be significant.

The data in Table 1 indicate a variability in habitat preference for members of the order. The genus *Trachelomonas* was represented in cypress ponds by 25 species. This is nearly twice the number of trachelomonads present in any other habitat. When considering that 12 of these species were recorded only from cypress ponds, a decided preference for such a habitat seems indicated. The acid condition prevalent in cypress ponds may be significant in this regard. According to Hall (1965), pH may affect the utilization of nitrogen sources by flagellates.

Single-habitat preference appears to be lacking for most of the other genera. The genus *Euglena* was represented in Campus Pond by 17 species, and in cypress ponds, sinks, Hogtown Creek, and the Santa Fe River by 12, 7, 7, and 7 species respectively. The minimum number of species of *Euglena* recorded from any one habitat was five, as contrasted with one for *Trachelomonas*, and relatively few species of this genus were recorded from only a single habitat. Distribution of the six species of *Lepocinclis* was comparable to that for *Euglena*.

The genus *Phacus* was found to be well represented in and nearly restricted to three habitats, i.e., Campus Pond, cypress ponds, and sinks, with approximately the same number of species found in each. All of the 34 recorded species were found in at least one of these habitats, and 17 were found in more than one. *Cryptoflana* was restricted to these same three habitats.

The remaining genera, *Anisonema*, *Entosiphon*, *Menodium*, *Distigma*, *Peranema*, and *Euglenopsis*, are colorless forms, and are generally similar in their patterns of distribution. Eight of the ten recorded species were found in sinks. Species were also recorded from cypress ponds and Campus Pond.

SUMMARY

1. Eleven genera representing 121 species of the Order Euglenida were recorded from various aquatic habitats in Florida.
2. Cypress ponds, sinks, and a pond receiving final effluent from a sewage disposal plant were found to contain the largest numbers of species.
3. Single habitat preference, i.e., cypress ponds, was indicated for *Trachelomonas*, but most of the other euglenoids were more widely distributed.

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